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METHOD FOR PRODUCING CHLORINE DIOXIDE AND ITS USE

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References:

DE 31 18 795 A1

A. Schmidt, Applied Electrochemistry [in German], Verlag Chemie 1976, pp. 67-70;

Ullmann's Encyclopedia of Industrial Chemistry, Verlag Chemie, Weinheim/Bergstr. 4th Edition, Vol. 9, p. 549.

The following data are taken from documents submitted by the applicant.
Petition for examination has been submitted in accordance with § 44 of the Patent Law.

[Summary]

The invention concerns a method for producing chlorine dioxide, where chlorine-containing compounds are electrolytically converted to chlorine dioxide. The resulting chlorine dioxide can be used for water treatment and disinfection at low equipment cost.

Description

The invention concerns a method for producing chlorine dioxide and the use of the chlorine dioxide.

The production of chlorine dioxide from sodium chlorite and chlorine or acetanhydride or from chlorates using SO_2, HCl, NO_2 or sulfuric acid is known. Chlorine dioxide is an unstable non-storable gas, which breaks down in explosive fashion and must be produced on site in special plants in accordance with need. The chlorine dioxide that is formed readily undergoes oxidation reactions.

Moreover, it is known that a clearly defined microbiological water quality must be maintained for drinking water and for public swimming pools, according to legal requirements. In most cases this treatment of the drinking water or swimming pool water takes by means of chlorine or related byproducts, for example chlorine dioxide.

Because of the danger and of environmental contamination that exists in the production, storage and transport of chlorine and also chlorine dioxide, there is a need for alternatives to the said products or for a method of producing chlorine compounds that can be produced and used directly on site that does not threaten the environment.

It is also known that hypochlorous acid can be electrolytically produced as the point of use, but technically costly devices and costly maintenance are necessary. Most of these "hypochlorous acid processes" are only intended to be used in a closed water circulation system, but where about 4 to 7 kg of salt per m^3 must be dissolved in the water.

The disadvantages of the known methods and the use of chlorine were the danger to health, the change of the taste of the water, the danger of corrosion of metal parts and the extensive maintenance.

Therefore, there is the need to make available a means for a water treatment and disinfection that can be produced cheaply, safely and without great technical expense.

In accordance with the invention, this task is solved by the traits of Claims 1 and 4. Preferred embodiments can be taken from the dependent claims. In accordance with the invention, the chlorine dioxide used for water treatment and disinfection is electrolytically produced from chlorine-containing compounds. Here chlorine dioxide, in addition to other products in small amounts, is generated from chlorine compounds in a substantially known electrolysis apparatus. Better disinfection of drinking water or swimming pool water is possible with the thus produced chlorine dioxide even at high pH values, and long lasting bacteriostatic can be achieved. Advantages of the thus prepared chlorine dioxide, are costs lower than with the known chlorine dioxide production processes, the directly-on-site production, the safe production, simple management, reduced energy demand, less stress on the environment, water

preparation corresponding to DIN standards, and no corrosion of pipes that come into contact with the chlorine dioxide solution.

It proved to be advantageous to use as the chlorine-containing compounds sodium chlorite ($NaClO_2$), especially because of the low cost of this material and the fact that byproduct formation, other than chlorine dioxide, is thus reduced. In accordance with the invention it thus proved that to be sufficient to use sodium chlorite ($NaClO_2$) in a concentration from 0.1 to 5 g/m^3, preferably 0.5 to 1.5 g/m^3, of water in the electrolysis chamber. To reduce the development of byproducts that will possibly have an adverse effect on the water treatment and disinfection and to reduce the absolute content of byproducts, sodium chlorite that is as pure as possible should be used, where sodium chlorite with a minimum purity of 80% has proved to be advantageous. Because of the essentially unproblematic character of the use of sodium chlorite for health and because of the low concentration of sodium chlorite that is used, contamination of the treated water with the chlorine dioxide that is produced does not occur even at reduced electrolysis efficiencies.

The electrolysis of the sodium chlorite solution can be carried out under standard conditions, where the use of noble metal coated metal electrodes or metal electrodes coated with combinations of various noble metals as anode and cathode has proven to be advantageous for the purpose in accordance with the invention, where the elements and/or compounds that are usually used for electrodes can be used. For purposes of the invention iron and titanium electrodes have proved to be especially advantageous, with titanium electrodes being really especially preferred. Normal conditions to be used are an electrolysis solution of 1 g sodium chloride per m^3 water, and the electrolysis is carried out at currents from 1 to 8 amperes, preferably 4 amperes, and a voltage of 220 volts, where chlorine dioxide is formed in sufficient amounts up to 0.1 to 0.15 mg/L. The current can also be provided as direct current from a substantially known commercially available control unit.

According to demand the electrolysis can be carried out continuously or at intervals, when the chlorine dioxide formed during the electrolysis is introduced into the swimming pool or drinking water supply depending on demand via substantially known dispensing devices for continuous and/or stepwise feed. A use of up to 0.2 mg chlorine dioxide per liter of water of water to be treated is seen as sufficient for the quality of the water to correspond to the DIN Standard 19643-1.

Claims

1. A method for producing chlorine dioxide, which is characterized by the fact that chlorine-containing compounds are electrolytically treated.

2. A method as in Claim 1, which is characterized by the fact that the chlorine-containing compound is sodium chlorite.

3. A method as in Claim 1 or 2, which is characterized by the fact that the electrolysis is carried out at currents from 1 to 8 amperes and a voltage of 220 volts using metal electrodes coated with noble metals.

4. A method for water treatment and disinfection, which is characterized by the fact that chlorine dioxide produced electrolytically as in on